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(71) Applicants
The A.P.V. Company Limited,
Manor Royal, Crawley, Sussex
(72) Inventor
Stephen John Gibbon
(74) Agents
Marks & Clerk,
57/60, Lincoln's Inn Fields, London WC2

(54) Plate heat exchanger

(57) In a plate heat exchanger required to handle corrosive, toxic or radioactive fluids, wherein each plate has a peripheral recess 21 or like formation adapted for receiving an elastomeric gasket, the plates are welded together in pairs by the method comprising the steps of inserting into the gasket recess 21 of a first plate of said pair a metal packing piece and welding the second place (e.g. by a laser or electron beam weld 22 running along the base of the recess) superimposing a second plate 23 on to the first in contact with the packing pieceand welding the second plate to the packing piece (e.g. by a laser or electron beam weld 24). The packing piece 11 may be of hollow or solid cross section and is preferably of the same material (e.g. titanium or stainless steel) as the plates. In use a service fluid in heat exchange with the said corrosive etc. fluid is confined by peripheral and normally elastomeric gaskets 6.

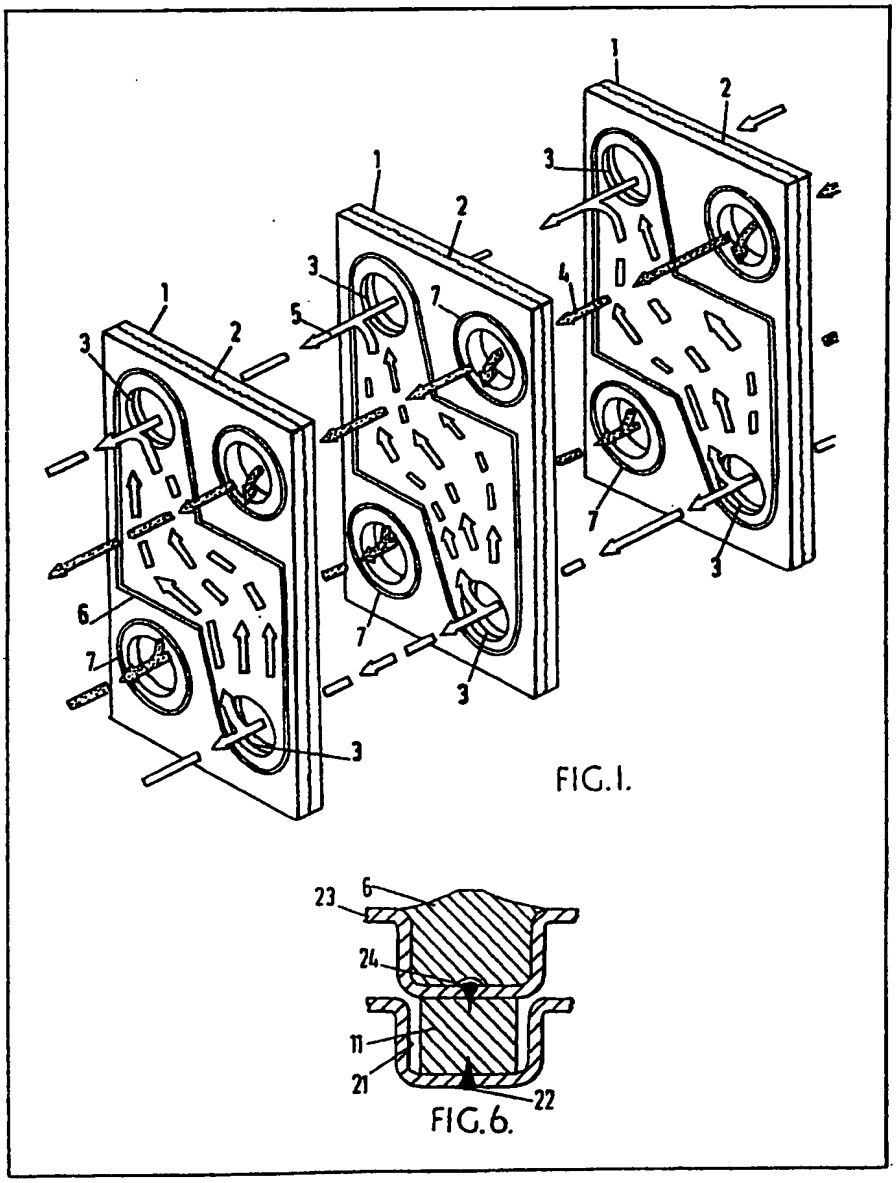

FIG.1.

FIG.6.

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

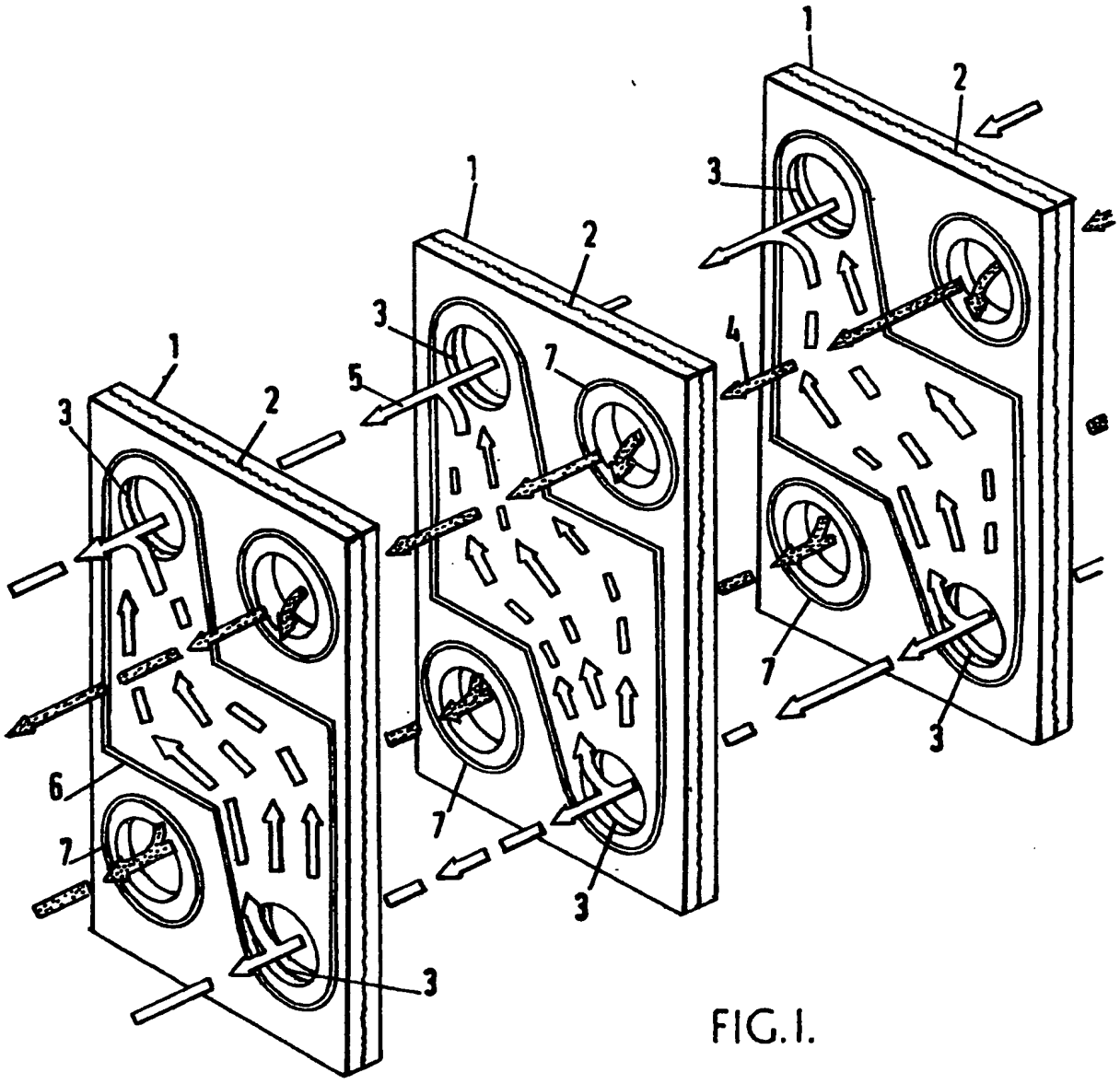

FIG.1.

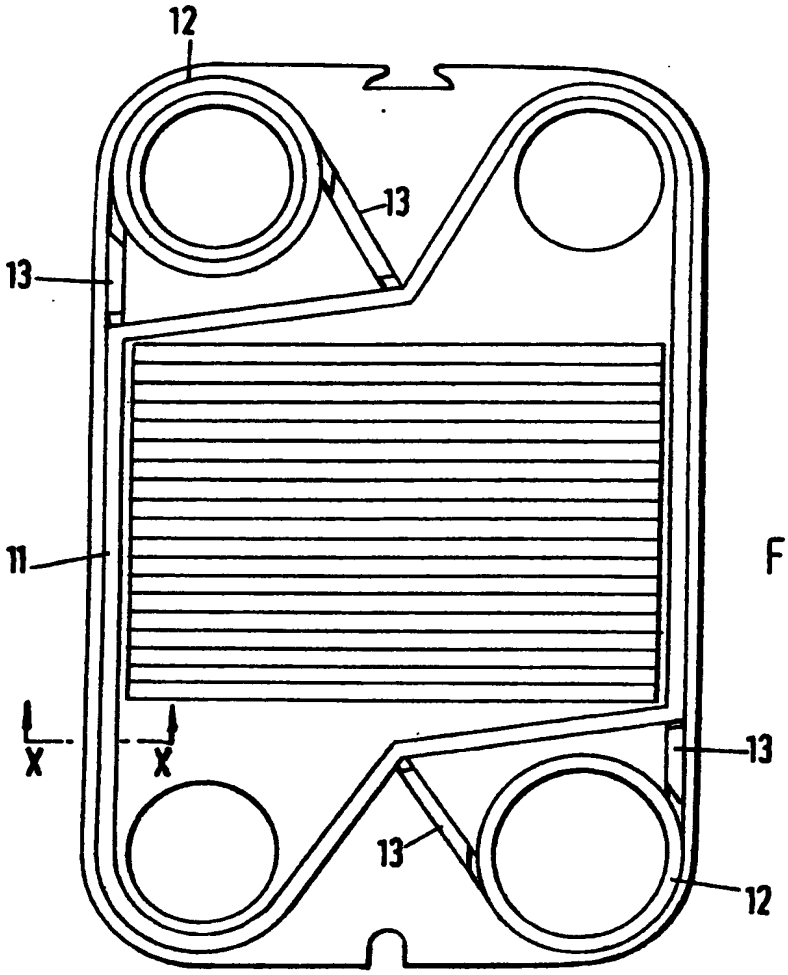

FIG.2.

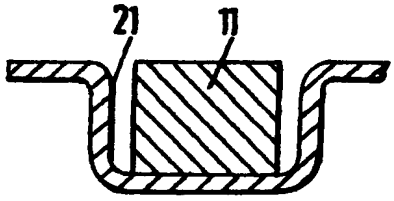

FIG.3.

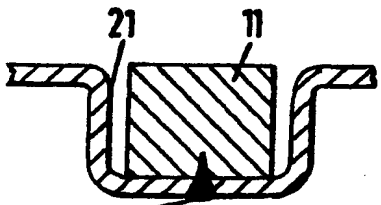

FIG.4.

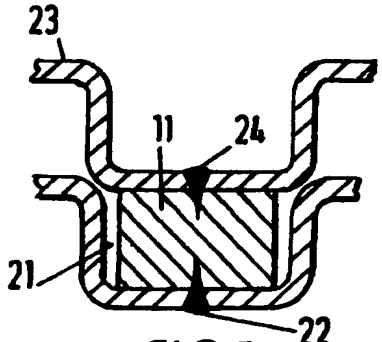

FIG.5.

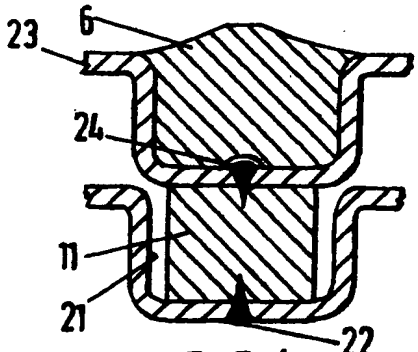

FIG.6.

SPECIFICATION
Plate heat exchanger

This invention relates to plate heat exchangers.

A plate heat exchanger comprises a pack of plates arranged in spaced face-to-face relationship to define flow spaces between adjacent plates. The flow spaces are in communication with supply and discharge ducts for heat exchange media formed by aligned holes in the plates. Peripheral sealing gaskets are normally provided to define the boundaries of the flow spaces and further gaskets are provided to control communication between the ducts and the flow spaces. The gaskets are normally housed in recesses or grooves pressed into the plates.

The gaskets are normally of an elastomeric material and when dealing with corrosive fluids it is necessary to avoid contact between the fluid and the elastomeric gasket material. Also, the sealing with a conventional elastomeric gasket material may not be sufficiently reliable when the fluids are highly toxic or radioactive.

Recourse may therefore be had to welding to provide a more secure seal.

Welding together every plate in a heat exchanger would not only be difficult but also undesirable, since once welded the plate pack could not be opened for inspection, cleaning, repair or replacement of damaged plates.

The methods hitherto proposed for welding together heat exchanger plates in pairs have required two types of plate to be produced with edges specifically designed for welding together (using electric resistance welding). The production of such plates would be expensive in terms of tooling and development time. Obviously it would be advantageous from cost and time aspects to weld together standard heat exchanger plates. Previous attempts to achieve this have failed.

It is an object of the present invention to provide an improved method for welding together pairs of similar heat exchanger plates.

According to the present invention, there is provided a method of welding heat exchanger plates together, the heat exchanger plates each comprising a gasket-receiving formation adapted to receive and retain an elastomeric gasket, the method comprising the steps of introducing a metal packing piece into the gasket-receiving formation of a first plate and welding it into position, superimposing a second plate onto the first in contact with the packing piece and welding the second plate to the packing piece.

Preferably, the packing piece is introduced along the line to be followed by a peripheral gasket and further packing pieces are provided round the duct-forming apertures which are to be isolated from the flow space between the welded plates.

Conveniently the welding is achieved by laser or electron beam welding. The packing pieces may be of the same material, e.g. stainless steel or titanium, as the plates, and will normally be of solid section, although hollow section packing pieces could be used if required.

The invention will be further described with reference to the accompanying drawings, in which:

Figure 1 is an exploded view of a form of heat exchanger having the plates welded together in pairs;

Figure 2 is a plan view of a heat exchanger plate with a metal packing piece insert laid in the gasket groove; and

Figures 3 to 6 are sections along the line X—X of Figure 2 illustrating various stages in the method of welding heat exchanger plates together.

Turning first to Figure 1, this illustrates three successive pairs 1 of heat exchanger plates which are welded together adjacent their peripheries as indicated by the irregular lines 2 and also around the through-holes which form ducts for the fluid which does not have to pass into the space between the welded pair of gaskets. This latter welding is indicated by broken lines 3.

It will be appreciated that the dangerous fluid is the one flowing through the flow spaces within the welded pairs of plates, as indicated by the shaded arrows 4, whereas the non-dangerous service fluid flows in the flow spaces formed between adjacent pairs, and this flow is indicated by the unshaded arrows 5. As shown in Figure 1, flow of the service fluid is confined by peripheral gaskets 6 which are normally elastomeric, and around the duct forming apertures to be isolated from the service fluid there are also provided port rings or gaskets 7. These are of a corrosion and leakage resistant form, the details of which form no part of the present invention.

Turning now to Figure 2, one of the plates of the welded-up pair is shown as having packing pieces in its gasket recesses. These packing pieces are of hollow or solid section metal, preferably the same metal as the plates themselves, e.g. stainless steel or titanium, and they are laid in the gasket grooves of the plates. It will be seen that there is a single closed contour packing piece 11 forming what may be termed a peripheral seal for the flow space, and two packing pieces 12 of circular form around the duct-forming apertures. Also provided are shorter packing pieces 13 in the lengths of gasket recess between the peripheral packing piece 11 and the circular packing pieces 12. These perform no sealing function but are important as far as the overall strength of the pack is concerned.

Turning to Figures 3 to 6, it will be seen that in Figure 3 a packing piece 11 is shown in position in a gasket recess 21, and Figure 4 shows a weld formed at 22 by means of a laser of electron beam welding to secure the packing piece 11 firmly to the base of the gasket groove 21. As shown in Figure 5, a second plate 23 is then superimposed on the first plate in contact with the packing piece 11 and is welded to this latter by means of a weld 24, also formed by laser or electron beam welding. The peripheral gasket 6 of elastomeric material may then be placed in the gasket recess of the

plate 23 to complete formation of the welded up pair. At the same time of course the gaskets 7 are also fitted.

It would seem that by use of this method standard plates having normal forms of gasket recess may be welded together without the need for any special formations being provided adjacent their edges. Also, the use of laser or electron beam welding enables the process to be carried out very quickly and under automatic control. It is also important to note that all of the welding takes place along the base of the gasket grooves in both plates of the pair so that when, in service, the plates are tightened in a conventional heat exchanger frame, the weld metal will be compressively loaded and will not be subjected to shear or tension. The chance of weld failure is therefore greatly reduced.

Various modifications may be made within the scope of the invention.

CLAIMS

1. A method of welding heat exchanger plates together, the heat exchanger plates each comprising a gasket-receiving formation adapted to receive and retain an elastomeric gasket, the method comprising the steps of introducing a metal packing piece into the gasket-receiving formation of a first plate and welding it into position, superimposing a second plate onto the first in contact with the packing piece and welding the second plate to the packing piece.

2. A method as claimed in claim 1, in which the welding is carried out along the base of the gasket-receiving formation of the first and second plates.

3. A method as claimed in claim 1 or 2, in which the packing piece is introduced along the line to be followed by a peripheral gasket and further packing pieces are provided around the duct-forming apertures which are to be isolated from the flow space between the welded plates.

4. A method as claimed in claim 1, 2 or 3, in which the welding is achieved by laser or electron beam welding.

5. A method as claimed in claim 1, 2, 3 or 4, in which the packing pieces are of the same material as the plates.

6. A method as claimed in any of the preceding claims, in which the packing pieces are of solid section.

7. A method of welding heat exchanger plates together, substantially as hereinbefore described with reference to the accompanying drawings.

8. A pair of heat exchanger plates when welded together by a method as claimed in any of the preceding claims.

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